## Chapter 3

## Conduct Data Collection

The process of implementing kanban scheduling begins by collecting data on the target process. The data that needs to be collected includes:

- Number of parts to be produced by the process
- Changeover times
- Downtime
- Scrap levels

Use your team to collect this data. The team should follow the guidelines in Chapter 3 of the book to ensure you get the data needed to calculate the kanban's size.

Once you have collected the data, then use the blank data collection form and annotated versions shown in Figures WB 3-1 and WB 3-2 to organize the data into a format for analysis. When you have the completed data sheet, review the data for consistency, accuracy, and realism. Make sure the units are consistent and correct. Also, make sure the numbers are real. Look for errors in the data, such as tabulation errors, recording errors, and unit errors.

## Examples

The following two examples are repeated from the book to help illustrate the data summation and analysis process.

## Figure WB 3-1

### Process Information Summary Sheet

Schedule Interval: _____

| Part Number | Part Name | Interval Production Requirement | Process Scrap Level | Downstream Scrap Level | System Scrap | Production Rate (for each unit) | Change over Time | Comments |
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| | | | | | | Total Change over Time | _____ | |

**Figure WB 3-2**

Process Information Summary Sheet: Annotated

Schedule Interval: _____

| Part Number | Part Name | Interval Production Requirement | Process Scrap Level | Downstream Scrap Level | System Scrap | Production Rate (for each unit) | Change over Time | Comments |
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Chapter 4 will use the production requirements data and the scrap information to calculate the adjusted production requirements.

Use guidance in Chapter 3 of the book to determine how to differentiate part numbers.

Fill-in either these two columns or the system scrap column.

Sum this column to get total change over time

Total Change over Time _____

***Example 1***

A plastic injection molding machine makes plastic rings for carnival games. Two different colors are produced--red (part A) and blue (part B). The machine makes two rings at a time, with a mold cycle of 30 seconds. The process has a system scrap of 3 percent. The mold is not changed when switching between colors, but the raw material hopper must be cleaned out between colors. This color change takes fifteen minutes.

The plastic molding pellets are delivered daily and the supplier has never missed a delivery. The rings must cool for fifteen minutes. They are made to order for five different customers.

The company has steady weekly orders of 2,500 red rings and 4,000 blue rings. The company promises next-day delivery of any order.

The company produces the rings one shift per day, five days per week. The plant has two 10-minute breaks and a 30-minute lunch. Each day the shift has a 10-minute shift starter meeting and 5-minutes/day is allocated for the monthly kaizen meeting, 5s activities, and a safety meeting. The plant does not have a preventive maintenance program so they experience one hour of downtime each day for minor breakdowns and adjustments.

The process information summary sheet for Example 1 is shown in Figure WB 3-3.

## Figure WB 3-3

### Process Information Summary Sheet: Example 1

Schedule Interval: Daily

| Part Number | Part Name | Interval Production Requirement | Process Scrap Level | Downstream Scrap Level | System Scrap | Production Rate (for each unit) | Change over Time | Comments |
|---|---|---|---|---|---|---|---|---|
| A | Red Carnival Ring | 500 | | | 3% | 15 seconds | 15 minutes | |
| B | Blue Carnival Ring | 800 | | | 3% | 15 seconds | 15 minutes | |
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Example 2

A plastic extrusion process line extrudes ten different profiles. Each profile is unique and is assigned a unique part number--3502 through 3512. The profiles are used in a downstream process where they are mold-spliced to create environmental seals for the company's main consumer product: electronic component carrying cases. The extrusion process experiences 5 percent scrap and 2 percent scrap in the mold splicing process. All profiles have a changeover time of 35 minutes. The demand and speeds for each profile are as shown:

| Part Number | **Component Case Demand** | **Part Length (in mm)** | **Production Rate (ft/min)** |
|---|---|---|---|
| **3502** | 500 | 500 | 50 |
| **3503** | 750 | 588 | 50 |
| **3504** | 350 | 1200 | 50 |
| **3505** | 250 | 300 | 60 |
| **3506** | 500 | 300 | 60 |
| **3507** | 500 | 585 | 60 |
| **3508** | 1200 | 690 | 60 |
| **3509** | 1000 | 1250 | 45 |
| **3510** | 900 | 400 | 45 |
| **3511** | 100 | 400 | 45 |

The process line averages 95 percent uptime. The process line is scheduled five days per week for one shift. All PMs and 5s activities are handled while the operation is running or on overtime.

The plastic molding pellets are delivered daily, but the supplier misses about 15 percent of their deliveries. The extruded profiles require no further cure time once they are extruded and cooled in the production process. Figures WB 3-4 to 3-6 show the Process Information Summary Sheet and illustrate the data analysis process for Example 2.

**Figure WB 3-4**

## Process Information Summary Sheet: Example 2

Schedule Interval: Daily

| Part Number | Part Name | Interval Production Requirement | Process Scrap Level | Downstream Scrap Level | System Scrap | Production Rate in Seconds (for each unit) | Change over Time | Comments |
|---|---|---|---|---|---|---|---|---|
| 3502 | | 500 | 5% | 2% | NA | 600.0 | 35 | |
| 3503 | | 750 | 5% | 2% | NA | 705.6 | 35 | |
| 3504 | | 350 | 5% | 2% | NA | 1440.0 | 35 | |
| 3505 | | 250 | 5% | 2% | NA | 300.0 | 35 | |
| 3506 | | 550 | 5% | 2% | NA | 300.0 | 35 | |
| 3507 | | 500 | 5% | 2% | NA | 585.0 | 35 | |
| 3508 | | 1220 | 5% | 2% | NA | 690.0 | 35 | |
| 3509 | | 1000 | 5% | 2% | NA | 1666.7 | 35 | |
| 3510 | | 900 | 5% | 2% | NA | 533.3 | 35 | |
| 3511 | | 100 | 5% | 2% | NA | 533.3 | 35 | |
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Total Change over Time: 350 minutes

## Figure WB 3-5

| Part Number | Part Name | Interval Production Requirement | Process Scrap Level | Downstream Scrap Level | System Scrap | Production Rate in Seconds (for each unit) | Change over Time | Comments |
|---|---|---|---|---|---|---|---|---|
| 3502 | | 500 | 5% | 2% | NA | 600.00 | 35 | |
| 3503 | | 750 | 5% | 2% | NA | 705.60 | 35 | |
| 3504 | | 350 | 5% | 2% | NA | 1440.00 | 35 | |
| 3505 | | 250 | 5% | 2% | NA | 300.00 | 35 | |
| 3506 | | 550 | 5% | 2% | NA | 300.00 | 35 | |
| 3507 | | 500 | 5% | 2% | NA | 585.00 | 35 | |
| 3508 | | 1220 | 5% | 2% | NA | 690.00 | 35 | |
| 3509 | | 1000 | 5% | 2% | NA | 1666.67 | 35 | |
| 3510 | | 900 | 5% | 2% | NA | 533.33 | 35 | |
| 3511 | | 100 | 5% | 2% | NA | 533.33 | 35 | |
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Same question as with the scrap: Do all the changeovers really take the same amount of time?

Copied incorrectly; should be 500 and 1200.

Are scrap levels really the same for 10 different profiles? Follow-up?

The calculations has mixed units between millimeters (the length) and feet (the line speed - feet/minute).

Total Change over Time 350 minutes

## Figure WB 3-6

Process Information Summary Sheet: Example 2

Schedule Interval: Daily

| Part Number | Part Name | Interval Production Requirement | Process Scrap Level | Downstream Scrap Level | System Scrap | Production Rate in Seconds (for each unit) | Change over Time | Comments |
|---|---|---|---|---|---|---|---|---|
| 3502 | | 500 | 3% | 3% | NA | 2.0 | 35 | |
| 3503 | | 750 | 5% | 2% | NA | 2.3 | 15 | |
| 3504 | | 350 | 6% | 4% | NA | 4.7 | 35 | |
| 3505 | | 250 | 5% | 2% | NA | 1.0 | 20 | |
| 3506 | | 500 | 5% | 2% | NA | 1.0 | 20 | |
| 3507 | | 500 | 4% | 2% | NA | 1.9 | 35 | |
| 3508 | | 1200 | 2% | 1% | NA | 2.3 | 35 | |
| 3509 | | 1000 | 5% | 2% | NA | 5.5 | 30 | |
| 3510 | | 900 | 3% | 1% | NA | 1.7 | 30 | |
| 3511 | | 100 | 5% | 2% | NA | 1.7 | 35 | |
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**After further data collection, the team determined that the scrap and changeover times were not the same. They solved the dimension mismatch by converting feet to millimeters:**

$$\textbf{Production Rate} = \frac{\textbf{60 seconds/min}}{\textbf{(line speed x 304.8 millimeters/foot)/ part length}}$$

Total Change over Time 290 minutes